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ABSTRACT

This teaching guide for motor development in the primary grades describes various areas of concern in motor development and suggests activities for the development of young children in each area. Section I discusses the importance of motor development. The next six sections define and describe particular areas of motor development and suggest activities in each area which may be conducted by classroom teachers or by physical education specialists. The six areas are body and self image development, temporal awareness, laterality (internal awareness of the two sides of the body and their differences) and directionality (awareness of and distinction between left and right, up and down, and front and back in the surroundings), programming of movement sequence, vestibular and kinaesthetic sensory-motor training (dealing with sense of balance and internal awareness of body and movement), and recognition and discrimination of forms (shapes) as they relate to other forms. Activities which can be used by parents to help children develop basic motor abilities at home are included in the last section. It is suggested that the physical development of young children greatly affects their later success in intellectual and social as well as psychomotor pursuits. (CM)

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APPROACHES TO PROGRAMS OF MOTOR DEVELOPMENT AND ACTIVITIES FOR YOUNG CHILDREN

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FOREWORD

Because planned experiences in movement are important to young children's physical development, this publication was developed to assist primary teachers in providing appropriate learning activities. It briefly describes various aspects of motor development as viewed by current educators.

We hope schools, with the assistance of this publication, will be encouraged to develop their own programs of motor development.

M.L. Brockette
Commissioner of Education

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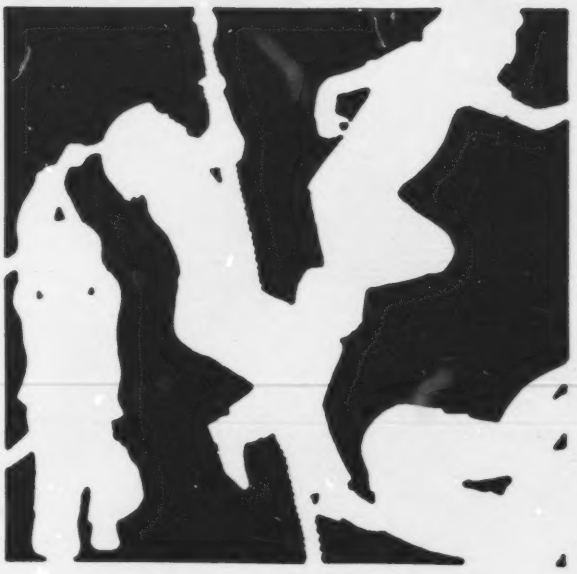
Introduction



Most educators agree that the physical development of young children greatly affects their later success in intellectual and social as well as psychomotor pursuits. Activities that promote balanced development and growth of all parts of a young child's body are essential to satisfactory development in all areas of the child's education.

This publication describes various areas of concern in motor development as viewed by selected educators who are currently involved in the field.

The first section discusses the importance of motor development. The next six sections define and describe particular areas of motor development and give suggested activities for primary children's development in each area. The activities may be conducted by classroom teachers or by physical education specialists. The classroom, cafetorium, activity room, gymnasium, and outdoor activity area all provide settings that can be used for motor development programs.

The last section is designed to help teachers give parents suggestions for assisting in their children's motor development through activities outside the school.

The bibliography lists references used in preparation of this publication.

Activities that promote balanced development and growth are essential to a child's total education.

Why Is Motor Development Important To Young Children?

Often, in a rush to give children a head start in pursuit of academic excellence, parents overlook a vital part of the child's development. The motor system forms a foundation for the growth and expansion of all human organisms. It must be carefully nurtured. Teachers can help parents understand the importance of motor development and suggest activities for them to use with their children.

The brain controls the muscles of the body, and the ability of the brain to send the proper signals to the muscles depends upon, among other things, experiences. Walking, eye movement, balancing, throwing, writing, and doing somersaults are all motor activities that are performed by muscles, dictated by the brain, and dependent upon thousands of previous experiences. Some activities, such as jumping rope, require large muscle coordination. Others, such as drawing a square, depend upon fine (small) muscle movement from both eyes and fingers. Much of basic school readiness depends upon many muscles working together. Just standing, for instance, depends on the proper tension and extension of 200 opposing muscles. When one considers the complexity of jumping rope – the coordination of leg, hand, eye, body, and arm muscles – the precision of muscle control is fantastic.

Body movement of a newborn child starts with random movement of large muscles. By the time he/she enters school, a very complex communication system between brain and muscles must be developed. Each progressive step requires a series of developmental experiences. A child must first stand, then step, then walk, then run. Each milestone is an indicator of previous successes in movement.

Catching and throwing a ball is often too complex an activity for a four-year-old. He/she must first be able to stop a rolled ball. To do this requires an estimation of its arrival time and bringing the hands together at the right moment. Fingers, arms, and eyes are involved. The next step might be catching a large bouncing ball, then a medium size ball thrown directly to the hands, and finally a small ball. The eyes must work as a coordinated pair of range finders. Only one eye is necessary for reading and recognizing objects. Both eyes are necessary to determine distance and arrival time of a thrown object. Later in school, reading will depend in part upon the movement of the eyes across the page. This skill is enhanced by successful experiences in catching a rolled ball earlier in life.

It is important to note that all communication skills – reading, writing, speaking, and gesturing – are motor-based abilities. Children who are deprived of a wide variety of movement experiences, especially through natural play opportunities, run the risk of perceptual and motor impairment. The child who climbs, rides a bicycle, skates, teeters on a balance board, tumbles on the carpet, and jumps on the bed has a better chance for good coordination than does the child who sits placidly in a chair "minding manners" or watching television.

Movement experiences become vital to the normal development of all children. Motor development cannot be left to chance.

Group Activities Reinforce Self Image Development

Part of self image is body image — an individual's concept of his/her body and its parts. The concept involves the knowledge of (a) the physical structure of the body and its parts; (b) the movements and functions of the body and its parts; and (c) the position of the body and its parts in relation to each other and to other objects.

Body image is important in the development of a child's self-concept as well as coordination. Children need to know themselves as pnysical persons, and this awareness of the physical body needs to be developed to the highest degree. If a child develops a good image of the body, he/she will have a sound base upon which to build the perceptual skills which will be needed in future classroom learning experiences.

Suggested Activities (listed in progression):

1. Teacher touches different body parts starting with the head and says, "This is my head; touch your head." Child then touches head and says, "I am touching my head."

2. Teacher instructs children to place hands on body parts on command. Examples: "Place both hands on your head;" "Place both hands on your shoulders."

3. Teacher asks children to close their eyes and then to touch body parts on command. Examples: "Touch your elbows;" "Touch your hips."

4. Children are asked to touch body parts using other body parts. Examples:

chin to chest	wrist to ear
nose to knee	elbow to leg
ear to shoulder	wrist to ankle
hands to hips	thumbs to toes
elbows to knees	fingers to back
foot to leg	toes to heel
head to knee	wrist to neck
arm to leg	

5. Children are asked to touch body parts to their surroundings. Examples:

head to floor	nose to window
hands to wall	knees to chair
wrist to table	back to floor
fingers to book	elbows to chalkboard
toes to wall	

6. Teacher instructs the children to move specific body parts on command. Examples:

Nod your head.	Stamp your feet.
Twist your neck.	Clap your hands.
Bend your elbows.	Wiggle your nose.
Rotate your wrists.	Open your mouth.

Open and close your eyes. Shrug your shoulders.
Snap your fingers. Bend your knees.

7. Children are asked to lie on their backs (change body orientation to space) and move various body parts. Examples: "Lift your head;" "Lift your legs;" "Lift your right hand;" "Touch your elbows together;" "Touch your left heel to your right knee."

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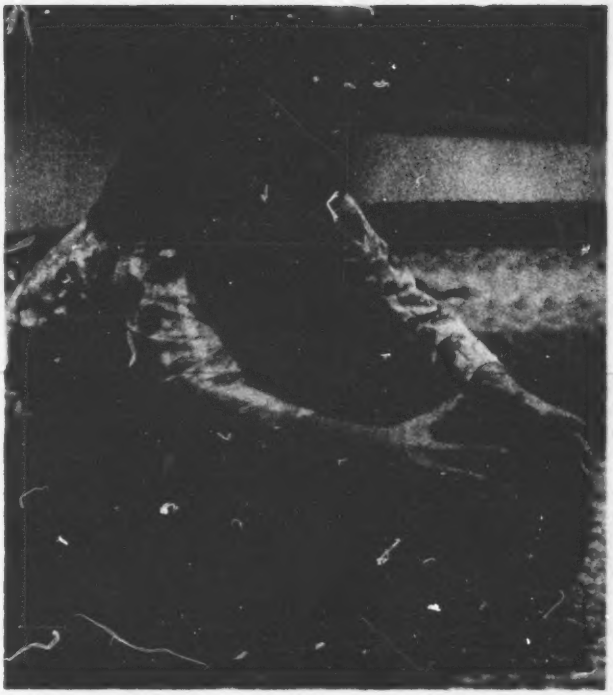
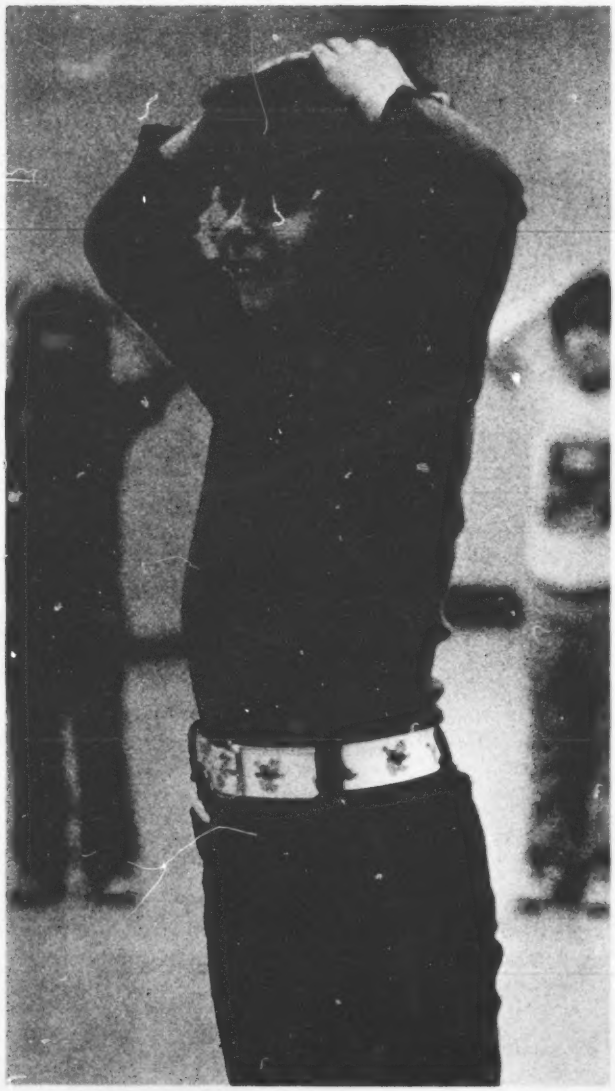


In learning to catch a ball, a child must first be able to stop a rolling ball. This requires an estimation of the ball's arrival time and bringing the hands together at the right moment.



"I'm touching my head" . . . "My hands are on my head" . . . In developing a good image of his physical body, the child builds self-concept as well as coordination.

Temporal Awareness

> The central problem in achieving efficient movement is the development and safeguarding of the sense of proportions of the factors of motion, weight, space, and time, and their controlled flow.
>
> Laban

In education programs, the relation of time to children's fine and gross motor movements is sometimes neglected. Teachers should be aware of the precise sequence of motion that is necessary to perform such simple movements as picking up an object, throwing a ball, or climbing a fence. All children should have planned movement experiences. After the basic motor patterns are established and the mechanics of movement are learned, a child should learn the relationship of time to movement. They should develop temporal awareness. Temporal awareness refers to the internalized concept of time which allows a child to integrate and organize a sequential movement pattern. For a young child, this is the beginning of coordinating movements of eyes and limbs in an efficient manner. According to Vannier, "eye-hand coordination or eye-foot coordination are an end result of fully developed temporal awareness."

Barsch breaks temporal awareness into three dimensions: sequence, rate, and timing. Sequence refers to the order of movements in an action as well as the counterbalancing of other parts of the body during the movement. Rate is the rhythm in activities such as walking, clapping, and jumping. Timing is the final quality added to the movement that makes it efficient. It is the quality readily observed in the form of a skilled athlete.

Research is limited in the area of temporal awareness and time perception. In the past, most studies in motor development have taken the form of reaction time and the effect of time on performance. The most in-depth discussion of the development of the child's conception of time is found in the classic studies of Piaget, who breaks down temporal development into six stages. The most advanced stage of an infant in development of time involves the child's ability to organize time as a representative series and the ability to mentally reconstruct the sequence of an event.

Internal Awareness

One of the first challenges of a young child in developing fine-motor control is to draw shapes and letters. He or she must first determine visually the direction of the lines necessary to reproduce the forms and letters and then to translate this perception into a kinesthetic movement pattern.

When drawing a form such as a square, children must be able to deal with one part at a time and organize the lines and angles into a series of events in time. Some children are not able to construct a square graphically because they cannot deal with one part at a time. These children need to develop the internal awareness of time which allows for the integration of a sequence of movements.

Developmental stages in the reproduction of forms are often used for diagnosis of motor problems. The child who reproduces forms as rapidly as possible is often trying to perform without concepts of temporal awareness.

Rhythm

In physical education and perceptual motor programming, rhythm has been used to illustrate the temporal quality of movement. A child who is developing temporal awareness is in the process of learning to synchronize motion rhythmically. A child

who demonstrates a walking or running pattern with unsteady, clumsy movements often has not developed adequate temporal awareness.

Basic movement skills such as running, hopping, galloping, and skipping should always be practiced with an emphasis upon synchronization. A child who has difficulty altering body rhythm when music tempo changes may be having temporal problems. Indication of problems in temporal awareness may also be noticed in fine-motor rhythmic movements such as clapping, snapping, and tapping, or in activities that require a child to bounce a ball rhythmically.

Coordination of Movement

A child's difficulties with timing and temporal awareness are most obvious in striking activities. Almost all teachers have observed children attempting to bat a softball. Some children swing at the ball with no apparent concept of the speed of the ball, the time it takes the ball to travel to the batting area, or the eye-hand coordination necessary to make the bat contact the ball. Children cannot develop the necessary eye-hand coordination for striking objects without first developing temporal awareness or time perception.

From her wheelchair, a child practices catching a balloon. As she learns to keep the balloon under control, she develops time perception and temporal awareness.

Temporal awareness is the essence of coordination. In almost all activities, humans unconsciously use time as an integral and inseparable part of the movement experience. Although timing, or rhythmic judgment, is often considered a mental prerequisite for efficient movement, this quality is learned through physical experiences. Time is a quality of movement – often inseparable from the other qualities of speed, force, flow, and space – yet time must be considered on an individual basis when observing the problems or assets of efficient movement for the young child.

Individualized Instruction

Activities to enhance temporal awareness should be included in individualized motor development programs. The following suggested program activities are intended to aid in the development of time perception but should be modified for each child's functioning level and needs.

Activities

Bean Bags

- Toss the bean bag from one hand to the other.
- Toss the bag into the air and clap your hands before it drops to the floor.
- Toss two bags and catch. Toss two bags in juggling fashion.
- Toss the bag into the air, turn around, and try to catch the bag.

Ball Control

- Bounce a ball while in a standing, kneeling, sitting, or prone position while focusing on visual targets.
- Bounce the ball back and forth across a midline from one hand to the other.
- Bounce a small ball and catch. Try dropping the ball with your right hand, slap the floor, and catch it with the same hand on the first bounce.
- Hit or kick a swinging ball with emphasis on maintaining control.

Balloon Activities

- Tap a balloon with right hand and then with the left hand while keeping the balloon under control.
- Try tapping the balloon with different body parts.
- Tap the balloon using different sequences, such as two times with the right hand and two times with the left.
- Tap the balloon and assume different body positions.

Rhythms

- Perform movements skills (skip, hop, gallop, slide) to uneven and even beats or tempo.
- Clap, snap, and tap to the beat of a metronome, drum, or other musical instrument.
- Interpret and act out ideas to selected music (creative rhythms).
- Participate in story plays and singing games.

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Children learn to synchronize motion rhythmically as they clap, snap, and tap to the beat of recorded music.

Laterality And Direction-ality

Children's first understanding of direction seems to be the difference between left and right, a concept called laterality. Laterality refers to the internal awareness of the two sides of the body and their resulting differences.

While there are anatomical controls in the operation of the two sides of the body, regulation of the abilities of the sides of the body is a learned phenomenon. Learning experiences should assist in this development. Laterality is important since it helps a child become oriented to and aware of space, the theory being that the body becomes the focal point in understanding the external world.

Children lacking in laterality awareness may lose their balance frequently, may have difficulty in following a left-to-right progression when reading, may not be consistent in using the right or left hand or foot, may mirror movements while writing at the chalkboard, and/or may make reversals such as confusing b's with d's when writing.

Whereas laterality seems to refer to an internal awareness of the two sides of the body, directionality represents a projection of directional concepts into external space. Directionality, therefore, refers to an awareness of and distinction between left and right, up and down, front and back in the world surrounding the child. After directional concepts are mastered in the "near space" of the child, they are then projected farther away in space. It would seem, therefore, that development of directionality within a child is significantly influenced by the development of laterality. Important concepts to be learned in this domain include (1) learning where the midline of the body is, (2) learning how to reverse the task when crossing the midline without interrupting the task, and (3) learning to reverse always when the midline is crossed. Children who have not developed directionality may have difficulty judging whether objects are on the right or left side of the body, may not start on the left side of the page when reading, may have difficulty in crossing the midline visually, may not distinguish the right and left body parts on themselves or others, and may have reversals in reading.

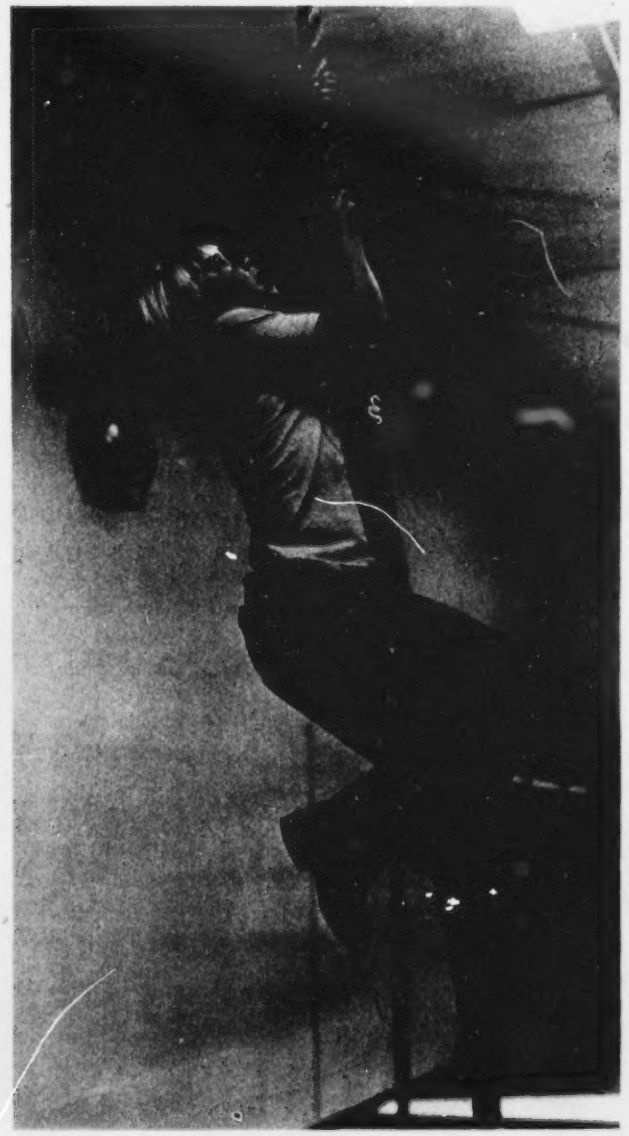
A review of the literature will suggest many activities in which the abilities of laterality and/or directionality are to be found. Few, if any, activities exist that incorporate only the perceptual motor ability of laterality and/or directionality. Below are activities that incorporate laterality and/or directionality and therefore might be used to assist a child in developing these abilities.

Activities For Laterality/Directionality

- Participating in trampoline activities such as bouncing, seat drop, quarter turn during a jump
- Practicing activities with the dominant hand such as squeezing, cutting, throwing, drawing, sewing, tracing, handwriting
- Practicing activities with the dominant foot such as kicking, hopping, object sorting, toe painting, drawing
- Playing tether ball
- Playing statue, a game in which children must stop in awkward positions
- Imitating animal walks

Swinging along on an overhead ladder helps a child to develop his internal awareness of the two sides of his body.

- Using small sandbags on the feet and/or arms of a child so that during specified and unspecified movements, he/she becomes more aware of the movements of the body parts
- Reproducing large geometric forms or drawings on the chalkboard
- Using musical recordings to accompany commands such as, "Stamp your left foot"
- Studying directions on a map
- Describing the exact location of an object or how to get to a place such as home
- Using aids to teach directional concepts. (Examples might include the use of a scarf with which the child will work according to instructions given.)
- Using aids to teach directional concepts, such as instructing a child to fold the left half of a piece of paper over the right half.
- Using the body to form shapes such as making the whole body into a circle
- Using lummi sticks or similar instruments to assist in the performance of a rhythmical routine
- Telling a story through finger play, such as in illustrating "Hickory, Dickory, Dock"
- Using playground equipment such as overhead ladders, climbing unit, and swings
- Working in teams to perform movements or make forms
- Climbing a hanging rope



Left over right, right over left . . . up . . . up . . . up. Rope climbing helps develop a child's concepts of laterality and directionality.

- Cargo net climbing
- Competing in teams in bench relays: performing movement patterns over, around, under a bench
- Participating in games such as Airport in which one child who is blindfolded pretends to be an airplane that is landing while another child acts as the control tower and remaining children act as obstacles to the landing pattern
- Competing in teams in ball relay races in which a ball is passed according to directions, such as "overhead" or "between the legs"
- Jumping over a rope from different directions but according to specific instructions
- Placing one hand on the ground and running around the hand. (Specific directions for movement may be added to the task.)
- Playing tag games such as Charlie Over the Water, Brownies and Fairies, Simple Tag, Tommy Tiddler, Run Rabbit Run, Cat and Rat, Shadow Tag, Old Mother Witch, Frog in the Sea
- Playing Keep the Basket Full: The leader scatters balls from a basket as quickly and as far as possible while the other children run after them and return them as rapidly as possible, trying to keep the basket full. (Tennis balls or small utility balls should be used.)
- Shuttlerunning between parallel lines 10 yards apart
- Hopping with different patterns such as three hops on the left foot, three hops on the right foot
- Playing Over the River: Two ropes are placed on the ground to represent the banks of the river. The children are asked to jump over the river.
- Estimating "how high I can jump" and comparing the estimate to the performance
- Participating in mathematical relays by jumping on a grid of numbers. (The first child jumps out a problem in the grid, and the second child must jump out the answer. A child from the opposing team confirms the accuracy of the response.)

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The Programming Of Movement Sequence

The movements of children are programmed in the nervous system much like a computer is programmed. By understanding the way in which this programming takes place, teachers can help more children have success in developing physical skills. Further, they will be able to understand better why one child can perform a movement and another cannot.

The manner in which children learn to perform a skilled movement can be compared to the manner in which they learn to write a sentence. No one can write a sentence until he/she can write the words that make up the sentence. No one can write words until he/she can write the letters which make up the words.

Let us compare this analogy to the performance of a physical skill, the forward roll, for example. If one begins from standing up, then squats down and executes a forward roll and continues until he/she is again standing up, the body has gone through a series of postures which began and finished in a balanced and familiar position. We might say that one has executed a "physical sentence."

In order to execute this "physical sentence," the body had to go through a series of postures: (1) The knees bent into a squatting position; (2) the hands reached the floor and took some of the weight in an all-fours position; (3) then the head was tucked and the hips raised in an inverted position; (4) the body weight was placed on the head, neck, and shoulders as the feet went over the head; (5) the rounded shoulders and neck then rolled up over the feet in a squatted position; (6) and, finally, the legs extended as the body came up to a standing position. These various body postures are the physical "words" or "vocabulary" which go together in proper sequence to make a well-executed movement.

In order to assume these various body positions, the joints in each limb were required to flex, extend, or rotate in just the proper amount. The position of each joint is, in a very real sense, a physical "letter" which is used to make up the body posture. Therefore, one can see that each limb must be able to execute all the positions required of the total activity and that they must go together in an order which will produce the various body postions making up the sequence. Thus we have observed that movements are made up of postures and postures are made up of limb positions.

The Problem of Learning

For those who work daily with children whose very nature is to run, scamper, kick, wiggle, throw, and dodge each other, this comparison of movement to written words and sentences seems far too simple. Children move so quickly and so fluently that one seldom sees the body postures mentioned. Movement rather than posture is the most observable characteristic of children. This is true because we are observing the children after they have already learned the body positions and have become masters at going quickly and fluently from one to the other. However, anyone who has reared a child through the period where he/she must learn to put the arm through the sleeve of a sweater, put the foot in a shoe, button a shirt, or

tie a shoe lace can attest to the fact that these lessons are slowly and sometimes painfully learned.

The problem a young child faces in trying to walk, for example, is that walking involves controlling serveral sets of muscles simultaneously, but the child's conscious mind can focus on only one concept at a time. When a child is concentrating on getting one foot out in front, the arms and shoulders fail to lean over the remaining foot, which is for a moment the only source of support, and the child falls.

Motor Programming

Fortunately children have a neurological process to overcome this problem, motor programming.

A child can consciously control the movement of one limb so long as he/she gives it full attention. However, when a particular limb movement is required over and over again, the requirements of muscle group, force, extent, and location become impressed upon the nervous system as a sequence pattern. Once the sequence pattern has been established through continued use, it no longer requires constant observation by the conscious mind. A child can then initiate the movement of one limb by conscious control and then switch his/her attention to a second limb or body part, and the first limb will continue its movement according to the established sequence pattern.

Jump . . . hop . . . jump . . . A body control activity helps children learn movement sequence.

Those limb movements most often required in daily activities gradually become established as permanent programs of muscle sequence and force to be called upon when needed.

Teaching Young Children

Because movement is the most dominant part of a young child's life, a teacher can assume that children participate in many forms of physical play other than the physical education program. So far as time is concerned, the physical education period at school is a very small part of the child's physical movement experience. It is best, then, to take advantage of a child's play experience in guiding his physical development. This can be done by using the words and concepts which already have meaning to children when describing the physical challenges to be performed. Thus, statements such as over the river, under the log, and touching the ceiling, are more apt to elicit smooth movement patterns than more technical instructions.

Body Control Activities

On page 17 is a list of activities that lead to good overall control of one's body. The movements cover five types of movement patterns: (1) forward rolling, (2) backward rolling, (3) inverted balancing, (4) upright agility, and (5) inverted agility.

The activities are presented in such an order that each movement helps to develop the body postures and control necessary for the movement that follows. Directions for some of the movements may be found in Texas Education Agency Bulletins 686, 687, 700, 706, 707, 708, Physical Education in the Elementary School, First Through Sixth Grades. Directions for other movements may be found in Developmental Gymnastics – Tumbling Mats by Garland O'Quinn, Jr.; University of Texas Press.

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In mastering the sequence of movements in a forward roll, a child begins to gain overall body control.

BODY CONTROL ACTIVITIES

I. Forward Rolling Sequence

NOVICE	INTERMEDIATE	ADVANCED
1. Bunny hop	4. Back rocker	7. Step-hop-roll
2. Water pump	5. Rock to feet	8. Reach over partner
3. Roll over forward	6. Front roll	9. Dive roll

II. Backward Rolling Sequence

NOVICE	INTERMEDIATE	ADVANCED
1. Back rocker	4. Back rocker	7. Shoulder balance
2. Touch behind	5. Sit back	8. Straddle touch behind
3. Back shoulder roll	6. Back straddle roll	9. Back roll

III. Inverted Balance Sequence

NOVICE	INTERMEDIATE	ADVANCED
1. Head balance	4. One free knee	7. Single knee up
2. Knee up	5. High free knee	8. Double knee up
3. Tripod	6. Double free knee	9. Head stand

IV. Upright Agility

NOVICE	INTERMEDIATE	ADVANCED
1. Bounding	4. Straddle jump	7. Straddle leg touch
2. Seat kicker	5. Straddle knee touch	8. Sitting toe touch
3. Heel slapper	6. Straddle leg touch	9. Straddle toe touch

V. Inverted Agility

NOVICE	INTERMEDIATE	ADVANCED
1. Straddle jump turn	4. Straddle turn	7. Barrel roll
2. Straddle support	5. High straddle support	8. Step hop
3. Straddle turn	6. Barrel roll	9. Cartwheel

Vestibular And Kinesthetic Sensory-Motor Training

When people move from place to place
Or move to catch, or hit, or throw,
The moves may come in halting, labored prose
Or in poetic verse with easy measured flow . . .

Francis Stroup

Whether the movement patterns of a child connote poetry or labored prose depends upon the speed and accuracy with which the central nervous system (CNS) coordinates and translates the millions of nerve impulses arriving every second from 10 different sense modalities. Neurologically distinct from one another, each sense modality has a special type of end organ (sensory receptor) and its own separate pathway from the receptor up the spinal cord to the brain.

The 10 sense modalities that enable humans to perceive the world are (1) vision, (2) audition, (3) taste, (4) smell, (5) touch/pressure, (6) kinesthesis (internal body and movement awareness that gives one space, time, force, and flow perceptions of self), (7) vestibular (sense of balance and equilibrium), (8) temperature, (9) pain, and (10) common chemical sense. Individual differences, reflecting diversity in genetic endowments and training, enable some persons to take pride in their good sense of smell, vision, or hearing. Athletes and dancers are known for their exceptionally fine sense of balance, space, and timing. They seem to know at all times where their bodies are in space and exactly how much force to use to throw or kick a ball a certain distance. Their movements exhibit a flow and gracefulness that is often called good coordination. Which of the 10 sense modalities must be strengthened to assure that a child's emerging movement patterns will be poetry rather than labored prose? Certainly seeing, hearing, and feeling the external world are important, but efficient movement requires special training of the senses responsible for perception of the stimuli originating inside the body. Chief among these are the vestibular and kinesthetic senses.

The vestibular system, with its sensory receptors located in the inner ear, houses the sense of balance. It enables a child to detect motion, to feel changes in the earth's gravitational pull as body parts (especially the head) are moved, and to perceive acceleration and deceleration. Newell Kepart, in The Slow Learner in the Classroom, states that, through vestibular feedback, gravity (the one constant in the spatial world) becomes the zero point for all further learnings about the body and various space relationships. Unconscious perceptions of the center of gravity and line of gravity thus develop as a toddler masters the intricacies of balance in achieving locomotion. Moreover, the vestibular sense enables a child to distinguish between movement which originates in his or her own body and that which may be seen or touched in the external world. The functions of the vestibular system occur largely below the level of awareness; thus the well-coordinated person takes balance for granted.

Authorities, in discussing the problems of the awkward or clumsy child, consistently emphasize the need to work on balance. As early as 1933, Paul Schilder, writing in the Journal of Nervous and Mental Disease, described the vestibular system as "a

coordinating apparatus for (all) sensory functions." Kepart, although apparently not sophisticated enough in neurology to refer to the vestibular sense, stresses the importance of balance activities to enhance laterality, a word coined by him and defined as the internal awareness of left and right. Such internal awareness neurologically results from vestibular and kinesthetic functions.

Jean Ayres, an occupational therapist, probably has written the most of any researcher about the role of the vestibular system in sensory integration and learning disorders. She believes that vestibular stimulation (rocking, spinning, rolling, falling, swinging, skiing) is one of the most powerful tools available for remediating sensory integrative dysfunctions. It, along with tactile stimulation, should be introduced as early as possible in perceptual-motor training programs.

In studies relating aspects of perceptual-motor functioning to academic success, balance is usually the one factor that correlates most highly with reading ability. Ismail and Gruber in Motor Aptitude and Intellectual Performance, for instance, reported that symmetrical and asymmetrical hopping was the best motor criterion for predicting academic success. This finding, however, must be interpreted cautiously since it was based on a correlation coefficient of only .348.

The kinesthetic sense, sometimes called the "muscle sense," has receptors located within the joints, muscles, tendons, ligaments, and skin. These sensory receptors govern the internal (and often subconscious) perception of such factors as space, time, force, and flow. For instance, the kinesthetic sense tells a person whether the elbow is bent or straight in a tennis forehand drive, whether or not the chin is tucked in a forward roll, and how stable the body tripod is in the preliminary stages of a head stand. It contributes to the development of body concept, that is, the ability to judge one's position and direction in space and to estimate one's size in relation to an opening. Kinesthesis is also the perception of the exact amount of force and speed needed to throw a ball a particular distance, the degree to which a muscle group is relaxed or tense, and the extent to which a movement is bound or free.

Like intelligence, kinesthesis is not a general ability. It includes many different factors, each of which must be taught and measured separately. Among the tasks included in most tests of kinesthesis are: (1) imitation of movements; (2) duplication of specific joint positions; (3) accuracy and precision in moving objects; (4) duplication of a muscular tension of a known amount; (5) size discrimination; and (6) weight estimation.

These kinesthetic tasks, taught within a movement exploration, fun-and-games structure, form the basis of good elementary school physical education. Imitation of movements and duplication of specific joint positions occur, for instance, each time a child

As children squeeze under a low beam on a challenge (obstacle) course, they learn size discrimination and develop kinesthetic sense.

attempts to replicate the movement patterns of the teacher or a skilled performer. Challenge (obstacle) courses teach size discrimination as children squeeze through narrow spaces and duck under bars. Weight estimation skills are fostered as children experiment with lifting their own bodies as well as those of peers and external objects through space.

The degree of refinement of a child's vestibular and kinesthetic perceptual abilities is largely dependent upon the teaching approach. The more that problem solving is demanded, the more aware the child will become of the information the body is continuously processing. Elimination of visual data through the frequent use of blindfolds enables the youngster to separate out kinesthetic and vestibular perceptions. Only then can they fully concentrate on what Arthur Steinhaus so beautifully called "thoughts within the muscles." If, as he said, "thoughts which do not get into the muscles never fully possess the mind," all physical education must emphasize vestibular and kinesthetic learning in order to help children achieve their potentials for knowledge.

SPECIFIC ACTIVITIES

For Vestibular Stimulation

- Discuss and experiment with the body's center of gravity. Note this is the imaginary point (usually in the anterior pelvis in the standing position) where the body weight is most concentrated.

- Blindfolded, try balancing your center of gravity directly over a walking beam, coffee can stilts, or a bench. Experiment with movements in which your center of gravity no longer falls directly over the surface on which you are balancing. Experiment with movements in which you raise and lower the center of gravity, as in walking on tip toes versus walking in crouched fashion.

- Lie prone on a large cage ball and allow someone to roll you back and forth.

- Lie prone on a scooter board and try different ways of coming down a four-by-six foot ramp elevated about one and one-half to two feet at one end.

- Experiment with different ways of rolling the body, varying the speeds, and see how many continuous rolls you can perform.

- Blindfolded, try hopping in various rhythms, such as three hops on the right followed by two hops on the left repeated several times.

Jumping from tire to tire in a sensory-motor training activity helps children develop good coordination.

For Kinesthetic Stimulation

- Make a wall chart with marks denoting your ankle, knee, waist, midchest, and shoulder heights. Blindfolded, try to touch the exact markings on the chart.

- Play Pin the Tail on the Donkey and variations which demand precision while blindfolded. Play dodgeball with the stipulation that the ball must touch a specific body part to earn points.

- Indicate a level of aspiration for throwing, bouncing, or kicking distance, such as, "I will throw this beanbag exactly 20 feet," and practice until your body does what your mind wishes.

- Put varying amounts of sand in empty spice jars so you have 10 or more jars of slightly different weights. Blindfolded, see if you can put the jars in order from lightest through heaviest.

- Develop challenge courses which demand creeping through spaces, running around obstacles, and climbing up ladders or over walls. Practice with and without blindfolds.

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Developing Form And Figure-Ground Discrimination Through Movement

The emphasis on children's receiving early motor training for developing concepts on which cognitive processes are to be formed is being accepted more enthusiastically than ever before. Attention is being focused on new and creative activities which heighten the development of readiness skills needed for success in the classroom.

One important readiness skill which enhances learning in the classroom is the recognition and discrimination of forms (shapes) as they relate to other forms.

Early motor experience affords children an opportunity to explore and describe their environment in a three-dimensional plan as their body parts work independently and in combination through controlled movement. Such experience will enhance a child's understanding of laterality (an unconscious, internal awareness of left-right, up-down, front-back within the body); and directionality (a conscious awareness of laterality projected onto external space). The mastery of these concepts has been shown to have a direct relationship to proficiency in areas of learning in the classroom.

A unique challenge for teachers involved in early stages of children's classroom learning is to aid the transfer of students' previous experiences with three-dimensional manipulative objects to two-dimensional representation.

Moving Through The Thinking Process

Noted educators such as Maria Montessori and Mable Fernald saw the importance of sensorimotor integration in aiding children to learn such tasks as letter and number recognition, handwriting, and reading skills. Movement as a learning medium is not new. Physical education provides an opportunity for children to actually move through the thinking process.

Developing cognitive learning through gross motor activities presents a great challenge for physical educators and classroom teachers concerned with the early development of children. Although little controlled research has been conducted as to the role gross motor activity plays in the development of cognition, there nevertheless is evidence to support its use as a learning media.

Developing Form and Figure-Ground Discrimination

Frostig says that the maximum period for perceptual development occurs in children between the ages of 3½ and 7 years of age. This would suggest that, within this time, such visual perceptual skills as form and figure-ground discrimination can be learned most effectively.

Figure-ground discrimination, as defined here, is the ability to differentiate a specific figure (form) from its background, for example, the ability to focus attention on the form of a diamond in a figure-ground design while tuning out the extraneous background stimuli.

Since the discrimination of forms is made in relation to other existent forms (figure-ground), form and figure-ground discrimination training should coincide. The development of visual form and figure-ground discrimination is a learned skill and involves an understanding of space, distance, and direction. In order for children to comprehend what they see, and to follow through with an appropriate motor response, accurate discrimination of visible likenesses and differences, as they relate to their surroundings, must be made. Vision as referred to here, is the interpretation of information received through the eyes and matched with information gained through other sensory modalities. Visual discrimination is the ability to respond to the distinctive differences in shapes. Upon examination, one can readily see how different combinations of geometrical shapes make up the symbols used within the written language (alphabet and numbers).

When learning to discriminate forms within a figure-ground relationship, the primary concern is with the visual and tactile-kinesthetic sensory modalities. However, the auditory modality is also important and cannot be dismissed, as it enhances instruction and language acquisition. The integration of these modalities (learning channels) in a coordinated, functional level is most important for achieving success in school.

Importance of Form and Figure-Ground Discrimination

A number of researchers believe there is a direct relationship between form and figure-ground discrimination and success in learning. After reviewing numerous studies concerning visual perceptual dysfunctions and reading achievement, Strange concluded that, "in general, average and superior readers tend to perform better than retarded readers on tests of perceptual differentiation, tests of closure, and measures of lag in perceptual-motor maturation." Wunderlich lists visual imperception as one of the causes of poor reading. Ayers states, "There is some evidence that figure-ground visual perception is related to the higher brain functions reflected in intelligence tests and behavioral observations." Ayre also feels that "strong associative bonds hold between poor figure-ground visual perception and certain tests of tactile perception and motor planning." Cratty suggests that the figure-ground phenomenon appears to be one of the basic organizing components of perception. Gallahue found that figure-ground perceptual ability is an important aspect of a kindergarten child's ability to perform a pattern-walking task.

All these studies suggest that children who do not develop visual perception in form discrimination, figure-ground relationships, and visual-motor coordination might experience difficulty in the classroom.

Creating New and Innovative Learning Environments

Creating new and innovative learning environments should be an on going process for all those responsible for aiding the development of children. The increasing popularity of early perceptual-motor training programs for children has stimulated educators to develop innovative classroom techniques. A design such as that in the photo on page 26 is intended to aid children in learning cognitive skills involved in visual form and figure-ground discrimination.

The Design

The figure-ground design may be taped or painted on the floor, a suitable place on the playground, or on a plastic mat. The latter is recommended because of its multipurpose use for indoors or outdoors.

The design should be located where children may walk around it. They can thus view the shapes (forms) from different perspectives, enhancing their ability to locate shapes in different positions in relation to themselves.

The measurements for the design may vary according to space available. For indoor use, an 8' x 8' measurement is recommended; for outdoors, a 10' x 10'. Teachers have noted that smaller measurements limit the design's potential as a learning medium.

Suggested Student Objectives

The student will

- Develop concepts of body awareness, laterality, and directionality
- Develop visual awareness as related to spatial experiences
- Develop an understanding of geometric shapes
- Develop visual figure-ground discrimination

- Develop motor learning
- Develop motoric manipulative ability
- Develop recognition of letters of the alphabet, small case and capitals, and of numbers
- Develop visual-motor coordination
- Develop creative expression
- Complete a given task

Teaching Hints

Following are some teaching hints which may be helpful in introducing or reinforcing concepts for developing form and figure-ground discrimination.

General Considerations

- Place the forms (geometrical shapes, letters, and numbers) in view of the children at the beginning of the training session. Forms may be represented by pictures, objects, chalkboard drawings, or any other means.
- Refer to the different forms to be learned by their proper names.
- Integrate all sensory modalities in learning new concepts.
- Follow a sequence in presenting concepts of form and figure-ground discrimination.

Specific Techniques to Be
Used with The Figure-Ground Design

- Instructor walks along the form; children then duplicate the task.
- A rope may be used to outline the form to be learned. Outlining the form helps the children focus on it while tuning out extraneous stimuli. Children may walk on the rope (tactual-kinesthetic awareness; can be performed blindfolded). The rope might then be removed and the performance repeated (tactual memory).
- Children receive a visual or verbal cue to the form to be located. They then outline the form on the grid by means of: (a) heel-toe walk, (b) crawling,

(c) hopping, (d) bouncing a ball, (e) pushing an object, such as a small car, (f) tracing with finger or chalk, or (g) any locomotor movement.

- After locating the form on the design, children can reproduce it on the chalkboard and on paper.

Activities

Form Awareness

- Children are instructed to find as many shapes as they can that have the same name. Examples: How many circles can you find?
- Children are given instructions involving the relative sizes of shapes. Example: Find the smallest circle.
- Instructor or child walks a shape within the design. Student or class must identify the shape.

Position in Space and
Spatial Relationships

- Student is directed to find a shape in a particular position within the design. Examples:

  Find the circle in the upper right-hand corner of the design.

  Find a triangle in the lower half of the design.

- Student is directed to find a shape which relates to other shapes within the design. Examples:
  - Find a letter d which is inside a rectangle on the right side of the design.

  Find a circle that is touching the left side of a square.

Visual Memory

- Student is given a visual clue of the design to be located. The clue is then removed and the child executes a response.
- Instructor walks on, calls out, or points to several shapes. The student must repeat the sequence by using a method for outlining the forms on the design.

Possible Evaluative Tool

Indications of possible dysfunction in visual skills may be detected by the instructor through careful observation and analysis of the student's behavior during the use of the figure-ground design. Areas of difficulty which become apparent should be followed by further testing from a qualified individual so that a proper prescriptive program may be implemented.

Summary

The figure-ground design offers unlimited opportunities for exploration, observation, and discovery. It is an excellent device for developing readiness and for teaching geometric concepts (shapes, letters, and numbers) preparatory to reading and writing. Simple in design, yet versatile, the figure-ground design is a device which enhances learning in visual form and figure-ground discrimination, perceptual development, motor manipulative ability, and visual-motor coordination. It also helps to make learning fascinating and fun.

A visual figure-ground design may be used with functional as well as dysfunctional children. Cognitive skills which appear to be prerequisite to different readiness skills needed in the classroom may be learned through such cognitive motor activity.

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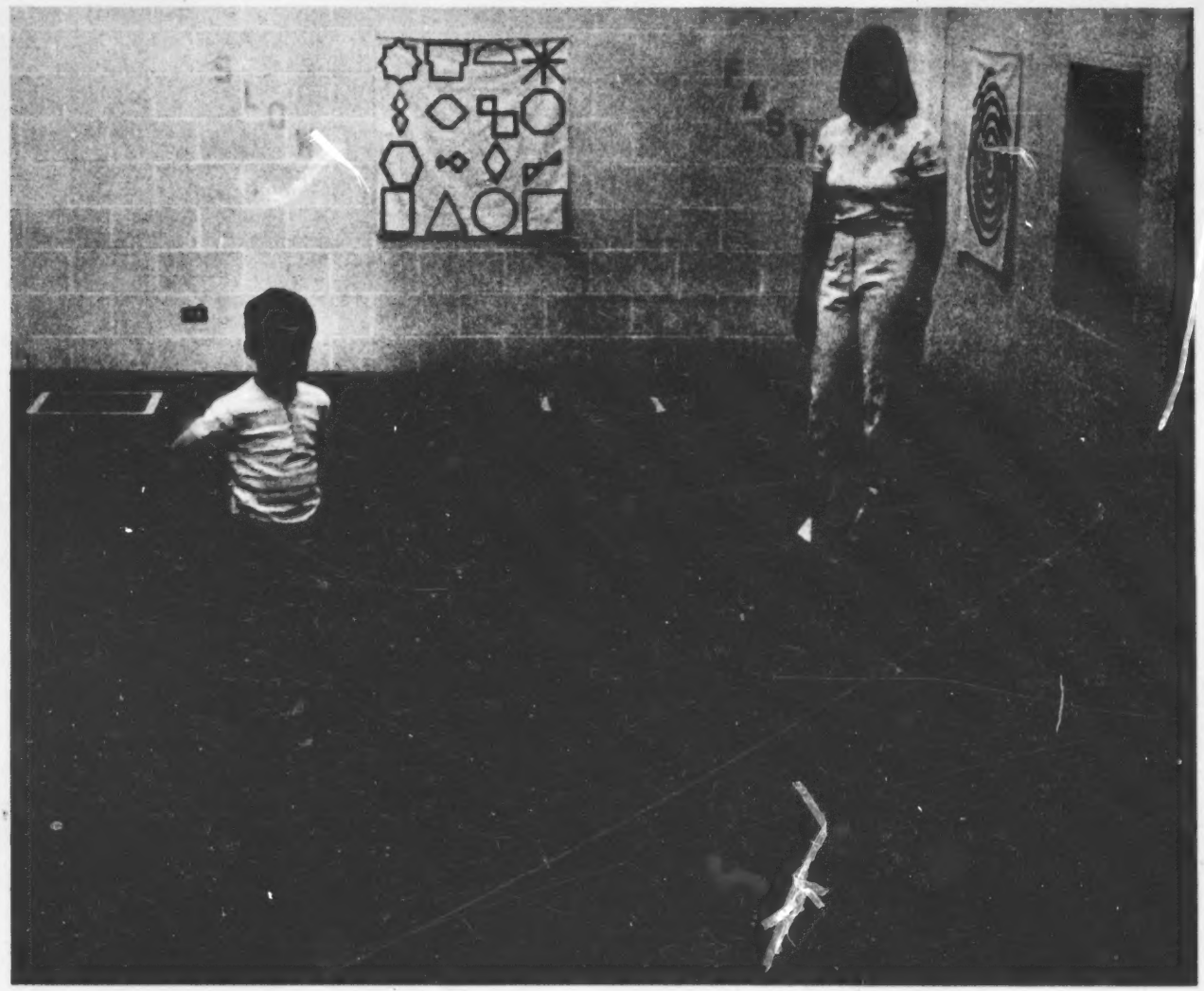

"Find a large diamond in the corner of the design" . . . Child concentrates on a pattern-walking task that will help develop his figure-ground perceptual ability.

Activities For Parents To Use In Helping A Child Develop Basic Motor Abilities At Home

The following activities are examples of movement experiences parents can encourage or guide their children into within the home environment. Not only should parents provide equipment and/or materials for purposeful movement activities, but, as often as possible, they should participate with the child. The activities are listed under the basic motor abilities they help the child to refine.

Balance Activities

- Riding bicycles, scooters
- Using stilts, pogo sticks
- Roller skating, skate boarding, etc.
- Walking board tasks (2" x 6" board, 8' x 10' long).
- Tumbling stunts on carpet (forward rolls, head stand)
- Jumping on a canvas covered intertube
- Climbing stairs, small ladders, etc.
- Balancing on various body parts

Eye-Hand Coordination Activities

- Bouncing and catching a ball
- Playing with tetherball and punching bag
- Jumping rope
- Using a "pitch back" net for throwing and catching
- Tapping balloons
- Playing marbles, jacks
- Using plastic scoops made from bleach bottles with tennis balls or bean bags
- Playing with hula hoops, Frisbees

Scooter skating develops balance, an important basic motor ability, and is a good movement activity a child can practice at home.

- Playing ring toss and bean bag throw games
- Coloring, painting, drawing
- Free hand drawing and coloring with large size crayons (avoid coloring books and hectographed materials)
- Painting directly on 18" x 24" paper with large brushes
- Hammering nails into boards
- Playing in sand box, working with clay, cutting cookies

Eye-Foot Coordination Activities

- Jumping rope
- Kicking balls
- Climbing stairs, ladders
- Walking on masking tape lines, ropes
- Jumping and hopping into obstacles (old bike tires)
- Playing hopscotch
- Stepping over objects of various heights (boxes, cans)
- Stepping on footprint patterns cut from cardboard or craft paper

Body and Space Awareness Activities

- Identifying basic body parts – elbows, shoulders, knees
- Drawing pictures of self or friends and identifying body parts
- Moving body parts in specific ways as challenged: nod head, clap hands, bend elbows, shrug shoulders
- Moving through an obstacle course (going over, under, between, through, into, around objects)
- Jumping and/or hopping into bicycle tires or hoops
- Crawling through play tunnels, boxes
- Swinging, climbing, exploring using backyard play equipment
- Moving as instructed – forward, backward, sideward – without touching objects or furniture within a given area

Locomotor (Transport) Activities

- Moving to recorded music
- Crawling and/or creeping on carpet
- Jumping rope
- Jumping from objects, over obstacles
- Hopping and/or jumping into tires, hoops
- Skipping, galloping
- Running short races, running around obstacles
- Playing hopscotch type games

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